



II. International Apitherapy and Nature Congress



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Ecology of Wild Bees in Nakhchivan Autonomous Republic

Nahçıvan Özerk Cumhuriyetinin Yaban Arılarının Ekolojisi

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Abstract

The article provides detailed information about the ecological characteristics of wild bees. In the entomofauna of the Autonomous Republic, polylectic species are more dominant than oligolectic species. Monolect wild bee species were not found in the fauna. It was determined that wild bees use entomophilous plants of 37 families of the flora of Nakhchivan Autonomous Republic as a food source. Species of *Andrenidae* and *Apidae* families have a wider food spectrum. Wild bees of these families use pollen and nectar of species of 22 and 27 plant families, respectively, which have a rich species composition in the flora of the region. Although the first flight of wild bees was observed in the territory of the Autonomous Republic in March, its activity spans from April to September. According to the flight periods, bees are conventionally divided into spring, spring-summer and summer groups. Autonomous Republic is significantly different from other regions of Azerbaijan due to climatic conditions. Therefore, the flight time of the spring forms of some species can be "accelerated or delayed" depending on the arrival of spring. Also, summer species are observed in spring due to the early start of the vegetation period. Flight times vary for the same species or species in different regions and altitude zones of the area. Wild bees mainly prefer nests dug in the soil, dug by gnawing on plant material, built in naturally formed cavities and open places. Among the wild bees distributed in the fauna of the autonomous republic, kleptoparasite - nomadic, sphecoid and social type species were also found.

Keywords: Nakhchivan, entomophilous, polylectic, oligolectic, phenology.

Xülasə

Məqalədə arıkimilərin ekoloji xüsusiyyətləri haqqında ətraflı məlumatlar verilir. Muxtar Respublika entomofaunasında polilektik növlər oliqolektik növlərə nisbətən daha çox üstünlük təşkil edirlər. Faunada monolekt arıkimisi növünə rast gəlinməmişdir. Müəyyən edilmişdir ki, arıkimilər Naxçıvan Muxtar Respublikası florasının 37 fəsiləsinin entomofil bitkilərindən qida mənbəyi kimi istifadə edirlər. *Andrenidae* və *Apidae* fəsilələrinin növləri daha geniş qida spektrinə malikdirlər. Bu fəsilələrin arıkimiləri müvafiq olaraq bölgə florasında zəngin növ tərkibinə malik olan 22 və 27 bitki fəsiləsinin növlərinin tozcuq və nektarından istifadə edirlər. Muxtar respublika ərazisində arıkimilərin ilk uçuşu mart ayında müşahidə edilsə də, fəallığı aprel-sentyabr aylarını əhatə edir. Uçuş dövrlərinə görə arıkimilər şərti olaraq yaz, yaz-yay və yay qruplarına bölünmüşdür. Bölgə ərazisi iqlim şəraitinə görə Azərbaycanın digər

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bölgələrindən xeyli fərqlənir. Buna görə də bəzi arkimilərin yaz formalarının uçuş müddəti yazın gəlişindən asılı olaraq “tezləşə və ya kecikə” bilir. Həmçinin yay növləri vegetasiya dövrünün erkən başlaması ilə əlaqədar olaraq yaz aylarında da müşahidə olunur. Uçuş müddətləri ərazinin müxtəlif bölgə və yüksəklik zonalarında eyni növ və ya cinslər üçün fərqli olur. Arkimilər əsasən torpaqda qazılmış, bitki materialında gəmirilərək qazılmış, təbii yaranmış boşluqlarda və açıq yerlərdə qurulmuş yuvalara üstünlük verirlər. Muxtar respublika faunasında yayılmış arkimilər arasında kleptoparazit - nomad, sfekod və sosial tipə mənsub növlərə də rast gəlinmişdir.

Açar Sözlər: Naxçıvan, entomofil, polilektik, oliqolektik, fenologiya.

1. INTRODUCTION

Nakhchivan Autonomous Republic's natural and geographical conditions, landscape diversity, vegetation, zoning, etc. are the main factors that determine the formation of rich fauna biodiversity. Since the first years of the last century, the fauna of the region has attracted the attention of many naturalists and collectors. As a result of systematic and consistent examination of the fauna in the region in the past period, valuable results have been obtained for the development of science and the country's economy. However, unlike other regions of Azerbaijan, the wild bee fauna, which stands out for its excellent activities in complex biological processes occurring in terrestrial ecosystems, has become the subject of significant research only in recent years in Nakhchivan, which is an integral part of it. Although the authors provided extensive faunistic information about bumblebees, ecological information was superficial. We started our basic research on wild bees in Nakhchivan Autonomous Republic in 2004 and we still continue. According to the 2004-2022 research results, the Nakhchivan wild bee fauna consisted of 418 species (Fateryga et al., 2020; Maharramov, 2015; Maharramov et al., 2021, 2023; Proshchalykin & Maharramov, 2020; Proshchalykin et al., 2019).

2. MATERIALS and METHODS

In the research conducted between 2004 and 2022, the trophic relationships of wild bees were given according to the plant families where they collected. The identification of plants by families was carried out by Professor A.Sh.Ibrahimov. Flight phenology is given according to capture periods, nesting and kleptoparasitism according to both our personal observations and literature data (Özbek & Banaszak, 1985; Proshchalykin, 2003; Proshchalykin, 2005).

3. RESULTS and DISCUSSION

Trophic relationships, flight phenology, nesting and kleptoparasitism of wild bees have also been investigated through many years of research in the region.

3.1. Trophic relationships. Bees are divided into two main groups according to their diet (Özbek, 1976; Proshchalykin, 2003):

Diffuse polylectic species, in which females belong to different genera, have a broad species composition, collect pollen from different plants, limited polylectic species, in which females

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collect pollen from some plant species belonging to different genera.

Oligolectic species whose females collect pollen mostly or only from plants of one family. Sometimes pollen is collected only from plants belonging to one or more closely related genera (limited oligolectic). A species that collects pollen from only one plant species is monolectic.

Polylect species in the wild bee fauna of the Autonomous Republic (*Hylaeus confusus*, *Hylaeus gibbus*, *Hylaeus variegatus*, *Andrena barbilabris*, *Andrena pilipes*, *Andrena chrysopyga*, *Andrena dorsata*, *Andrena flavipes*, *Andrena labialis*, *Andrena miutula*, *Andrena morawitzi*, *Andrena morio*, *Andrena nitida*, *Andrena rosae*, *Andrena thoracica*, *Andrena tibialis*, *Osmia coerulescens*, *Megachile argentata*, *Megachile versicolor*, *Amegilla quadrifasciata*, *Amegilla velocissima*, *Anthophora acervorum*, *Anthophora parietina* etc.) are dominant.

Andrena chersona, *Andrena humilis*, *Andrena limbata*, *Andrena nobilis*, *Andrena ovatula*, *Andrena truncatilabris*, *Andrena wilkella*, *Systropha planidens*, *Melitta leporina*, *Megachile apicalis*, etc. are oligolectic species. No monolect wild bee species have been found in the fauna.

It was determined that wild bees use entomophilous plants belonging to 37 families of the Nakhchivan AR flora as a food source. The food spectrum of wild bees according to families is reflected in the table below (Table 1).

Table 1. Food spectrum of wild bees

No	Plant families that wild bees feed on	<i>Colletidae</i>	<i>Andrenidae</i>	<i>Halictidae</i>	<i>Melittidae</i>	<i>Megachilidae</i>	<i>Apidae</i>
1.	<i>Berberidaceae</i>		+	+		+	+
2.	<i>Ranunculaceae</i>	+	+	+			+
3.	<i>Caryophyllaceae</i>		+			+	+
4.	<i>Tamaricaceae</i>	+		+		+	+
5.	<i>Salicaceae</i>		+	+			+
6.	<i>Cucurbitaceae</i>		+	+			+
7.	<i>Brassicaceae</i>		+				+
8.	<i>Malvaceae</i>		+			+	+
9.	<i>Moraceae</i>	+	+				
10.	<i>Euphorbiaceae</i>	+	+	+		+	+
11.	<i>Rosaceae</i>	+	+	+	+	+	+
12.	<i>Lythraceae</i>	+	+				
13.	<i>Onagraceae</i>			+	+		+
14.	<i>Fabaceae</i>	+	+	+	+	+	+
15.	<i>Linaceae</i>						+
16.	<i>Geraniaceae</i>		+			+	
17.	<i>Zygophyllaceae</i>	+	+		+	+	+
18.	<i>Peganaceae</i>	+		+		+	+
19.	<i>Celastraceae</i>						+
20.	<i>Rhamnaceae</i>						+
21.	<i>Elaeagnaceae</i>						+

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22.	<i>Apiaceae</i>	+	+	+	+	+	+
23.	<i>Valerinaceae</i>			+			
24.	<i>Dipsacaceae</i>	+	+				+
25.	<i>Campanulaceae</i>	+	+	+			
26.	<i>Asteraceae</i>	+	+	+	+	+	+
27.	<i>Rubiaceae</i>			+			
28.	<i>Gentianaceae</i>			+	+		
29.	<i>Asclepiadaceae</i>			+			
30.	<i>Convolvulaceae</i>					+	+
31.	<i>Boraginaceae</i>	+				+	+
32.	<i>Scrophylariaceae</i>		+	+		+	+
33.	<i>Lamiaceae</i>	+	+	+	+	+	+
34.	<i>Hyacinthaceae</i>		+				+
35.	<i>Alliaceae</i>	+	+	+			+
36.	<i>Convallariaceae</i>	+					
37.	<i>Asparagaceae</i>	+					

Apparently, *Andrenidae* and *Apidae* families have a very wide food spectrum. Wild bees of these families use pollen and nectar of species of 22 and 27 plant families, respectively, which have a rich species composition in the flora of the region. *Linaceae*, *Celastraceae*, *Rhamnaceae*, *Asclepiadaceae*, *Convallariaceae* and *Asparagaceae* families are the least visited plant species by bees.

3.2. Flight phenology. The activity of wild bees in the territory of Nakhchivan AR covers the months of April-September. According to the flight periods, wild bees (408 species) are conventionally divided into 3-spring, spring-summer and summer groups. The territory of the region is significantly different from other regions of Azerbaijan due to climatic conditions. Therefore, the flight time of the spring forms of some wild bees can be "accelerated or delayed" depending on the arrival of spring. Also, summer species are observed in spring due to the early start of the vegetation period. Flight times vary for the same species or species in different regions and altitude zones of the area. Thus, the flight duration of *Andrena thoracica*, *Halictus sexcinctus*, *Anthidium manicatum*, *Chalicodoma pyrenaicum*, *Anthophora aestivalis*, *Xylocopa iris*, *Xylocopa valga*, *Bombus incertus*, *Bombus lucorum*, *Bombus tristis insipidus* species is delayed by 20-25 days in the highlands, unlike in the plains. The maximum number of active wild bee species in the highlands was recorded in the first half of July. The high activity of wild bees in the plain zone occurs in April-May. The more southerly position of the zone and the related favorable climatic conditions favor earlier (April) and long flight (September) activity of bees. According to the results of multi-year studies, spring-summer species (259 species; 62%) have a great advantage (Figure 2).

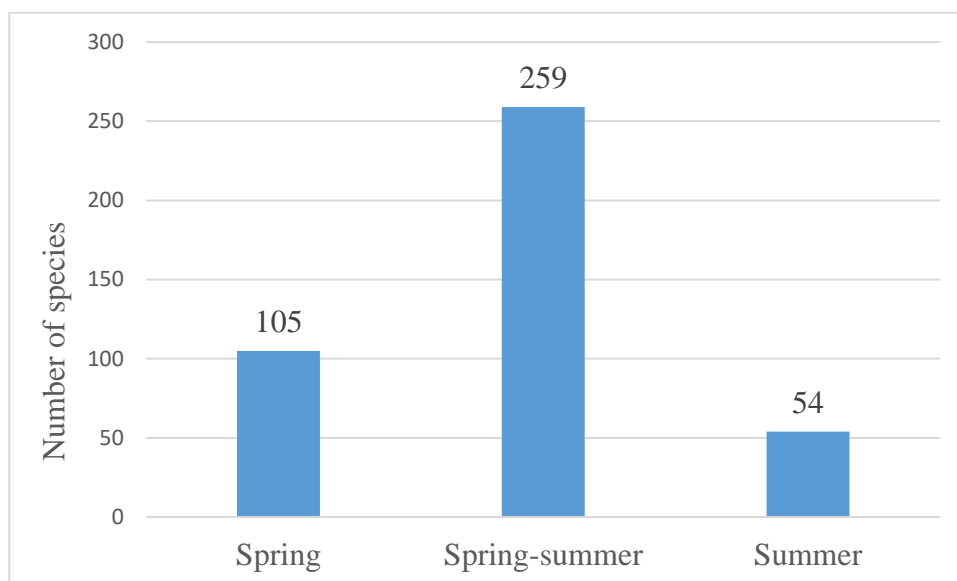


Figure 2. Number ratio of wild bee species according to seasons

3.3. Nesting. According to the nesting method, wild bees are divided into two: those that build nests for females to reproduce, and kleptoparasites, in which females take over another nest by killing or expelling the nest owner. Sometimes nest builders also invade the nests of other wild bees, which are more typical of primitive social species. Solitary bumblebees may invade nests belonging to their own individuals as well as nests belonging to members of other species (Banaszak et al., 2001; Proshchalykin, 2003).

Nests are divided into the following types according to their location (Banaszak et al., 2001): Those dug into the ground. These nests are typical of most wild bee species. The relief of the land surface, the exposure of the slopes, the presence and density of vegetation, soil moisture and a number of other factors play an important role in the choice of a nesting site by individual archimins.

Obtained by gnawing plant material. Such nests are characteristic of representatives of the *Megachilidae* family, the genera *Hylaeus* and *Anthophora*. Wild bee species generally prefer broken and cracked stems. Even direct access to the center of firewood and the construction of the nest in such materials greatly facilitates their work.

Naturally formed spaces. For this purpose, wild bees, first of all, use the gaps formed by xylophagous insects in the wood, in the dry trunks of plants, under the bark of trees, and from the old nests that other bees and bees use them. These inhabitants are essentially species of the family *Megachilidae*, *Apidae*, and the genus *Colletes*. Unusual nesting patterns are specific to species of the genus *Osmia*; they often nest in the empty calyxes of spiny molluscs.

In open places: The species of the *Apidae* family build their nests in tree stumps, in the canopies of wax, and some members of the *Megachilidae* family build their nests on stones, tree trunks, and leaves using resin, clay, and small stones.

3.4. Kleptoparasitism. This form of parasitism occurs when female wild bee individuals lay their eggs inside the eggs of nesting species. Unlike true parasitic insects, the offspring of a kleptoparasite grow on the food it provides for the host's larvae. According to the methods of parasitism, kleptoparasitic bees are divided into three types (Proshchalykin, 2003):

Nomad type. The female of the parasite lays her eggs inside the individual's eggs without entering into a conflict with the host and without touching the offspring. The larva of the

kleptoparasite destroys the host's egg or its young larva by destroying the body covering with its jaws. These parasites are species belonging to the genus *Nomada* of the *Apidae* family, *Dioxys*, *Anthidium* and *Megachile* of the *Megachilidae* family.

Sphecode type. Females of the genus *Sphecodes* destroy the host's offspring before laying eggs, often by fighting with it, driving it from the nest, or killing the mother female.

Social type. The female kleptoparasite enters the colonies of social bees and replaces, expels, or kills her queen. Workers force individuals to produce reproductive offspring of the parasite. According to our entomological observations, the wild bee fauna of the autonomous republic is *Nomada armata*, *Nomada baeri*, *Nomada bispinosa*, *Nomada chrysopyga*, *Nomada emarginata*, *Nomada ferruginata*, *Nomada fucata*, *Nomada gribodoi*, *Nomada lathburiana*, *Nomada lineola*, *Nomada marshamella*, *Nomada mutica*, *Nomada oculata*, *Nomada roberjeotiana*, *Nomada succincta*, *Nomada sybarita*, *Sphecodes albilabris*, *Sphecodes ferruginatus*, *Stelis odontopyga*, *Stelis jugae*, *Coelioxys rufocaudata*, *Coelioxys rufescens*, *Coelioxys elongata* live a parasitic lifestyle.

4. CONCLUSION

Polylectic and oligolectic species were more common in the entomofauna of the autonomous republic. Monolect species not found. Wild bees use entomophilous plants belonging to 37 families of the flora of the Nakhchivan Autonomous Republic as a food source. The flight phenology of wild bees on the territory of the autonomous republic covers the months from April to September. Wild bees are traditionally divided into spring, spring-summer and summer groups according to flight duration. According to the nesting method, wild bees are divided into two groups: those whose females build their own nests to reproduce, and kleptoparasites, which take over someone else's nest by killing the female or driving the nest owner away.

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